

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9612

Roll No.

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B. Tech.

(SEM. II) THEORY EXAMINATION 2011-12

ENGINEERING CHEMISTRY

Time : 3 Hours

Total Marks : 100

SECTION—A

1. Attempt all *ten* parts. Each part carries equal marks :—
(10×2=20)

- (i) Ice has lower density than water. Why ?
- (ii) Ethelene polymerizes but ethane does not. Why ?
- (iii) SN^2 reaction gives inverted products. Why ?
- (iv) Why β -carotene absorbs light in visible region ?
- (v) Why ferrous ammonium sulphate is used instead of ferrous sulphate in redox titration ?
- (vi) Explain why the value of NCV is greater than GCV.
- (vii) Explain why iron is corroded while gold does not.
- (viii) Give the order and rate of the following reaction :

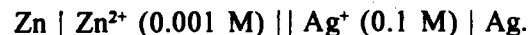
$$2 \text{NO} + \text{H}_2 \rightarrow \text{N}_2 + \text{H}_2\text{O}_2 \text{ (slow step);}$$

$$\text{H}_2\text{O}_2 + \text{H}_2 \rightarrow 2\text{H}_2\text{O} \text{ (fast step).}$$
- (ix) Explain why benzyle carbonium ion is more stable than ethyle carbonium ion.
- (x) F_2 is diamagnetic while O_2 is paramagnetic. Why ?

2.415 g. The crucible was then strongly heated for exactly 7 minutes at 950°C . The residue weighed 1.528 g. The crucible was then heated until a constant weight was obtained. The last residue was found to be weight 0.245 g. Calculate the percentage results of the above analysis.

- (b) What are fuel cells ? State advantages and disadvantages of fuel cells.

Calculate the Emf of the cell :



6. Attempt any **one** part of the following :—

- (a) Is it possible to have a quadruple point in a phase diagram for a one component system ?

Determine the number of degree of freedom in each of the following systems :

- (i) Liquid water and water vapour in equilibrium.
- (ii) Liquid water and water vapour in equilibrium at a pressure of 1 atm.

- (b) Discuss the effect of temperature on reaction rates.

The specific rate constant for the decomposition of formic acid is $5.5 \times 10^{-4} \text{ sec}^{-1}$ at 413°K . Calculate the specific rate constant at 485°K if the energy of activation is $2.37 \times 10^4 \text{ cal/mole}$.

7. Attempt any **one** part of the following :—

- (a) (i) What are liquid crystal ? Distinguish between nematic and smectic liquid crystals.
- (ii) What is biogas ? Discuss the mechanism of biogasification.
- (b) (i) Give the possible stereoisomer's of lactic acid.
- (ii) A metal has a fcc crystal structure. The length of the unit cell is 404 pm. What is the molar mass of metal atoms if the density of the metal is 2.72 g cm^{-3} ? [$N_0 = 6.023 \times 10^{23} \text{ atoms mole}^{-1}$].

SECTION—B

2. Attempt any **three** parts of the following :— (3×10=30)

- (a) (i) What is hydrogen bonding ? Differentiate between intra and intermolecular hydrogen bonding with suitable examples.
- (ii) What is E-Z nomenclature ? In what way it is better than cis-trans nomenclature ?
- (b) (i) Calculate the energy of activation whose rate constant is tripled by 10°C rise in temperature in the vicinity of 27°C.
- (ii) Write the mechanism of Aldol condensation.
- (c) (i) An edge of cubic cell of NaCl crystal is 6.5×10^{-8} cm. Assuming that four molecules of NaCl are associated per unit cell. Calculate its density.
- (ii) Distinguish between the corrosion of aluminium and magnesium.
- (d) (i) 100 ml of water sample has a hardness equivalent of 12.5 ml of 0.08 N MgSO_4 . What is its hardness in ppm ?
- (ii) Describe the chemistry for the following redox indicators; Potassium Ferricyanide and N-Phenyl anthranilic acid.
- (e) (i) Calculate the weight and volume of air required for combustion of 3 kg of carbon.
- (ii) What are graft and block copolymers ? Give examples.

SECTION—C

Note :— Attempt all **five** questions. Each question carries equal marks. (5×10=50)

3. Attempt any **one** part of the following :—

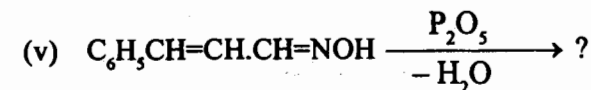
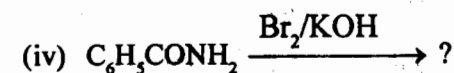
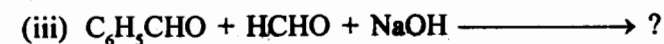
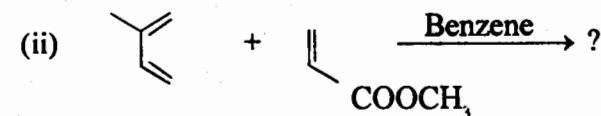
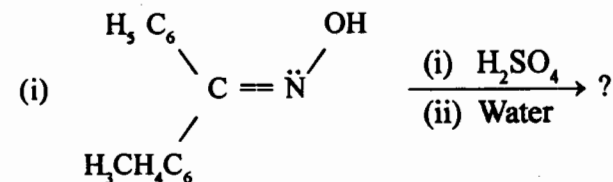
- (a) What are the causes and effect of (i) boiler scales (ii) caustic embrittlement ?

- (b) (i) What are auxochromes ? Why and how do auxochromes increase the colouring power of a chromophore ?
- (ii) How many proton signals would you expect in the NMR spectra of the following compounds: Cyclobutane and 2-Chloropropane ?

4. Attempt any **one** part of the following :—

- (a) What do you understand by atropisomerism ? State necessary conditions for a compound to show optical isomerism. Illustrate your answer with suitable examples.

- (b) Complete and name the following reactions;



5. Attempt any **one** part of the following :—

- (a) A sample of coal was analyzed as follows :
Exactly 2.5 g was weighed into a silica crucible. After heating for one hour at 110°C, the residue weighed